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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,633	08/26/2005	Christopher John Howard Wort	266485US6PCT	1368

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EXAMINER	
MILLER, DANIEL H	

ART UNIT	PAPER NUMBER
1794	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/529,633	WORT ET AL.	
	Examiner	Art Unit	
	Daniel Miller	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 November 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *39-45 and 47-77* is/are pending in the application.

4a) Of the above claim(s) *57-77* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *39-45 and 47-56* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 39-45, 47-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deguchi (EP 0844319 A1).

3. Deguchi teaches a diamond film formed via CVD methods (abstract). The CVD film is formed on a substrate having diamond grains deposited on the surface of the substrate (see figures). The diamond particles are preferably partially embedded into the surface of the substrate (column 4 line 25-35 and figure 4). The examiner is considering the partially embedded diamond particles to be a (DL) material having "diamond particles in a matrix" and also having surface with exposed diamond particles as claimed. The diamond films are hole free and continuous (Example 3). The film is inherently "at least in part" bonded to the particles by epitaxy because the diamond film is formed on the diamond particles in a CVD process substantially similar to applicant's process.

4. Regarding claim 55, the partially embedding of the diamond particles in to the surface of the substrate (as in figure 4) are considered deliberately enhanced epitaxy bonding.

5. Deguchi is silent as to the percentage of area that the epitaxy bonding covers, the percentage of diamond grains occupying the exposed surface of the CVD diamond layer.

6. However, generally, differences in concentration will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

7. It would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the eptaxial area and grains size and surface coverage, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

8. Regarding claim 54, it would have been obvious to provide the structure claimed by applicant with two opposing sides having the diamond film taught by Deguchi in order to interface as a heat spreader with two opposing surfaces (i.e. A heat source and a heat transfer device) as is common in thermal interface system known in the art.

9. Regarding claim 56, the partially embedding of the diamond particles in to the surface of the substrate (as in figure 4) are considered deliberately enhanced epitaxy bonding.

10. Claims 39-45, and 47-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deguchi (EP 0844319 A1) in view of Elkstron (US 6,914,025).

11. Deguchi teaches a diamond film formed via CVD methods (abstract). The CVD film is formed on a substrate having diamond grains deposited on the surface of the substrate (see figures). The diamond particles are preferably partially embedded into the surface of the substrate (column 4 line 25-35 and figure 4). The examiner is considering the partially embedded diamond particles to be a (DL) material having "diamond particles in a matrix" and also having surface with exposed diamond particles as claimed. The diamond films are hole free and continuous (Example 3). The film is inherently "at least in part" bonded to the particles by epitaxy because the diamond film is formed on the diamond particles in a CVD process substantially similar to applicant's process.

12. If an alternative interpretation of "in a matrix" is taken and the Deguchi's partially embedded diamond particles are not considered "in a matrix", as in the 102 rejection above, then Deguchi is silent as to diamond particles being in a matrix.

13. Ekstrom teaches an improved heat conductive material used for heat spreading (abstract) wherein the composite comprises diamond particles in a silicon or silicon carbide containing matrix material (claim 1). The resulting composite has a thermal conductance exceeding metals (column 13 line 25-30) and low thermal expansion (column 11 line 35-40), not true of metals.

14. It would have been obvious to one having ordinary skill in the art at the time the invention was made to substitute the diamond particle and silicon containing composite

material of Ekstrom with the silicon substrate in Deguchi in order to provide a substrate has a thermal conductance exceeding metals (column 13 line 25-30) and low thermal expansion (column 11 line 35-40), advantageous in heat spreaders.

15. Deguchi is also silent as to the percentage of area that the epitaxy bonding covers, the percentage of diamond grains occupying the exposed surface of the CVD diamond layer.

16. However, generally, differences in concentration will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

17. It would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the eptaxial area and grains size and surface coverage, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

18. Regarding claim 54, it would have been obvious to provide the structure claimed by applicant with two opposing sides having the diamond film taught by Deguchi in order to interface as a heat spreader with two opposing surfaces (i.e. A heat source and a heat transfer device) as is common in thermal interface system known in the art.

19. Regarding claims 55 and 56, the partially embedding of the diamond particles in to the surface of the substrate (as in figure 4) is considered deliberately enhanced epitaxy bonding.

Response to Arguments

20. Applicant's arguments filed 11/05/2007 have been fully considered but they are not persuasive. Deguchi specifically teaches that the grains are "embedded" as depicted in drawings.

21. Elkstrom teaches an improved heat conductive material used for heat spreading (abstract) wherein the composite comprises diamond particles in a silicon or silicon carbide containing matrix material (claim 1). The resulting composite has a thermal conductance exceeding metals (column 13 line 25-30) and low thermal expansion (column 11 line 35-40), not true of metals.

22. It would have been obvious to one having ordinary skill in the art at the time the invention was made to substitute the diamond particle and silicon containing composite material of Ekstrom with the silicon substrate in Deguchi in order to provide a substrate has a thermal conductance exceeding metals (column 13 line 25-30) and low thermal expansion (column 11 line 35-40), advantageous in heat spreaders.

23. Optimizing Deguchi or the combination of Ekstrom and Deguchi would have been obvious in order to optimize the thermal conductance of the material.

24. Deguchi specifically recognizes the significance of grain size of the material and teaches that diamond material can be used in films with larger diamond grain sizes known in the art (see background).

25. Elkstrom teaches two different grain sizes of diamond including one having a diameter of 80 micrometers or more, overlapping the claimed range of applicant (column 5 line 35-45). The two different grain sizes of diamond including a proportion being 80 micrometers or more are provided to get better thermal conductance and packing density of the diamond material (column 5).

26. It would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the eptaxial area and grains size and surface coverage, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

27. Finally, applicant has not shown that the specific limitation requiring the grain size to be four times the thickness of the CVD layer is critical to the invention. Since it has been held that generally the differences in concentration will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration is critical and "the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Given the teachings of larger grain sizes in Deguchi and Elkstrom the rejection is maintained.

Conclusion

28. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel Miller whose telephone number is (571)272-1534. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Keith Hendricks can be reached on (571)272-1401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Daniel Miller

JOHN J. ZIMMERMAN
PRIMARY EXAMINER